

INDUSTRY 4.0 eBOOK SERIES

HOW SMART YOUR FACTORY REALLY IS



A professional guide on how to measure the level of digitalization, automation, agility and efficiency of your factory.

PLATAINE[®]
people-smart automation



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Intro:

The smart factory concept in a nutshell

The smart factory concept represents a real and revolutionary transformation that is already happening and marks the future of industrial manufacturing.

The fourth industrial revolution, Industry 4.0, is comprised of players that harness multiple advanced technologies to improve different aspects of manufacturing as a whole and production processes in particular.

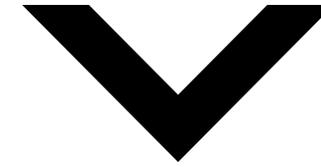
Among other things, a smart factory is one that maximizes raw material and resources and leverages technology to improve quality, time to market, boosts production and minimizes cost and waste, from both a business and an environmental point of view.

A smart factory implements technologies such as robotics and automation, cloud computing, big data, data analytics artificial intelligence (AI), and the internet of things (IoT), hence it can operate largely autonomously with an ongoing everlasting ability to optimize, a lot more than humans can.

The building blocks of a smart factory are visibility, connectivity and automation, derived by advanced analytics, the digital twin technological concept, the emergence of IoT, new age robotic capabilities and complex AI engines. All of these had to be created first, for the smart factory to become feasible.

The smart factories of today are based on man-machine (or man-software) teams, they are more automated and predictive. They lean on systems and advanced software that learn and adapt to changes in real time, and are therefore much more flexible than those of the past.

How smart is your factory



7 test categories

The notion of a 'smart factory' can be somewhat overwhelming at first, but much like the process of manufacturing itself, it is based on a series of steps that must be taken, sometimes independently and in other times, one after the other.

This guide offers a breakdown of the smart factory concept, enabling manufacturers to assess their current position and plan ahead, accordingly.

Below we examine seven specific categories that were carefully chosen, out of many. These categories represent the core building blocks of the industry 4.0 manufacturing

optimization strategy and by first analysing each one, and then by working on step-by-step improvements, a factory business can pave its way into becoming fully smart.

We've chosen to ask the hardest and the most important questions that will allow you to clearly evaluate your current position, as well as gain a firm grasp of the gaps that require some investment efforts. We invite you to closely examine every category as we guide you on how to try and estimate how smart your manufacturing business really is, and how it could be further advanced.

Category #1

What is your digitalization level

Background

The digital factory forms the foundation for all other advancements that will be mentioned here, and beyond them. It means a factory that opts for digital solutions over paper based ones, aspires to be paperless, and adopts a technological mindset.

Please note, while some may confuse the digital factory with the smart one, the digital factory stands on its own rights by digitizing the format of key procedures to make them more efficient, vs. the smart factory, which is usually automated and uses machine learning and AI technologies to translate the collected data into smart predictions and recommendations. In other words, the first step to a smart factory starts with digitalization.

The numbers show

A study found that the three main reasons for digitalization were penetrating new markets, keeping up with competitors, and improving uptime.

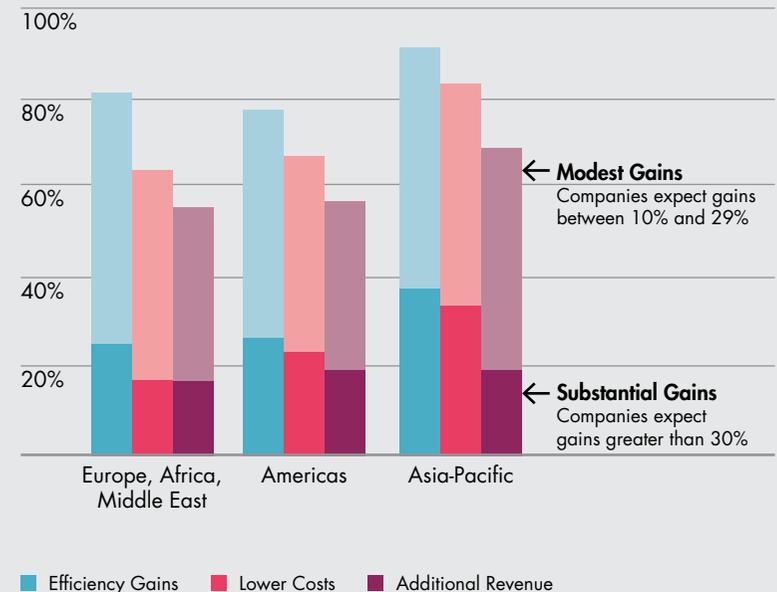
What are your top reasons for digitalizing?



Source: Engineering.com

This study also found that the top five technologies that were implemented by the surveyed manufacturers were cloud computing (85%), connected sensors for operations (65%), connected sensors in products (59%), 3D printing (39%) and data analytics (34%).

The same conclusions were reached by a [GE study](#), which found that despite the manufacturing industry's recognition of IIoT benefits, nearly 80% fail to have a mature plan for the implementation of these technologies. These results expose the gap between manufacturers' expectations from digitalization and their actual steps taken towards it.



Source: ilucatero.com

Category #1 - Test yourself

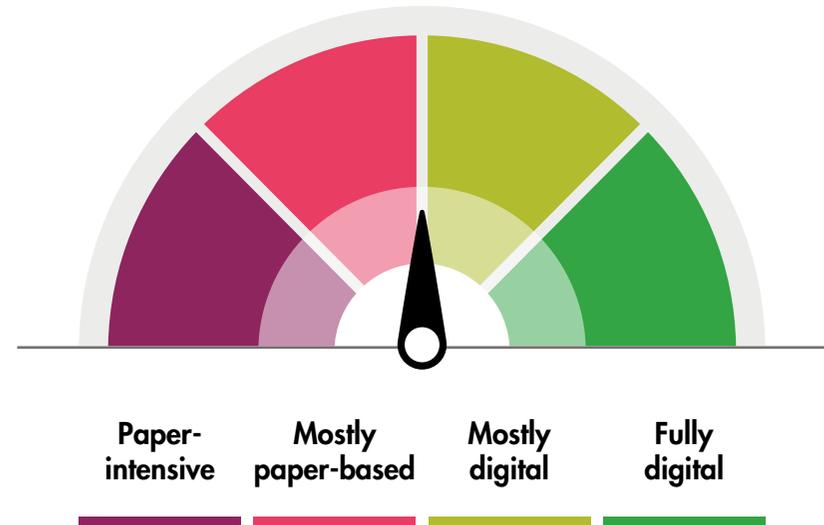
Estimate where your factory stands

We have chosen to define four levels of digitalization:

- 1. Paper-intensive:** Employees fill out paperwork and submit hand-written reports and manual updates, which increase the chances of human errors and create delays.
- 2. Mostly paper-based:** Paperwork is combined with digital procedures, but the first is still more dominant.
- 3. Mostly digital:** Similar to partially paper-based, but in this case, the digital procedures are more dominant.
- 4. Fully digital:** No paper is involved in the work processes and tracking mechanisms.

The implications of not going digital are massive. Not only is more labor added to the mix, but research shows that many more human errors tend to occur and the communication channels are often broken and unreliable. 'Paper based' factories tend to deal with delays and rework while visibility level to managers is low. As a result, these factories are less profitable and competitive. You can learn more about the implications of an outdated factory [here](#).

What is your digitization level



Category #2

What is your automation level

Background

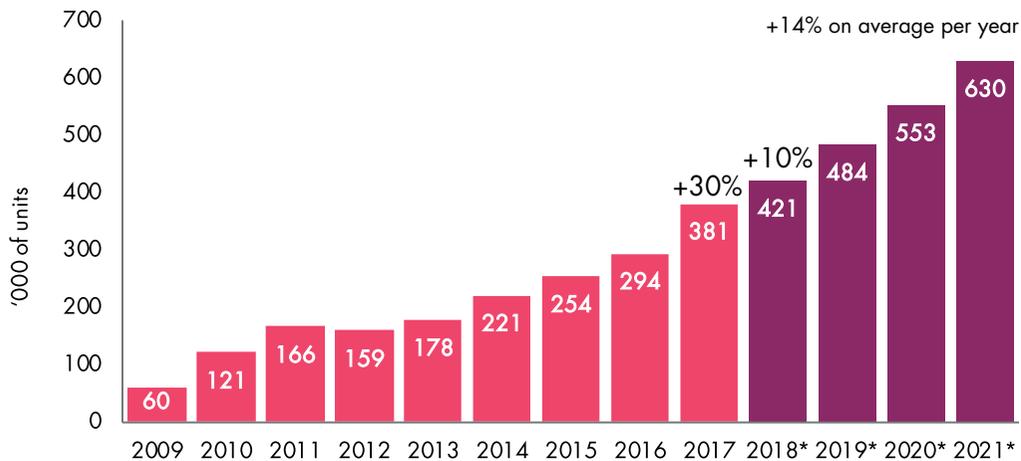
When discussing the notion of automation we include both robots and machines performing repetitive tasks and automated processes, which stand for streamlining operations and processes carried by both humans and machines. We refer to the transformation of previously mentioned manual procedures, that probably took place one at a time and involved a human factor with tasks that have been studied and perfected enough to enable machines and computers to take control and perform them automatically.

The numbers show

The rise of industrial robots in recent years can be used to indicate the rise of automation in manufacturing, as well as in other industries.

Here's an example - global industrial robot sales doubled over the past five years:

Estimated annual worldwide supply of industrial robots 2009-2017 and 2018-2020*



Source: International federation of robotics

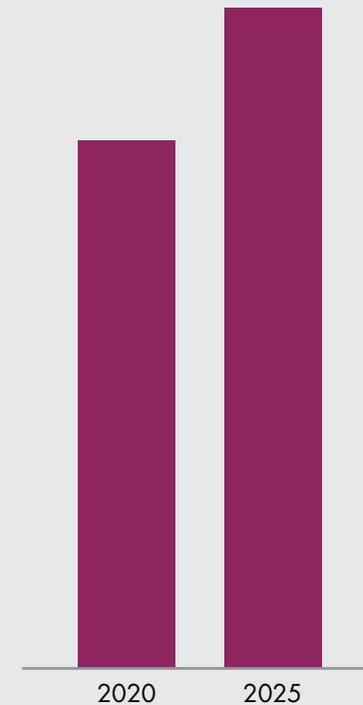
* Forecast

This trend proves that the benefits of automation are well recognized by the industry.

By 2025, it is forecasted that we will experience even further growth in the global automation market:

Market Summary

CAGR 7.23%



Source: Mordor intelligence

Category #2 - Test yourself

Estimate where your factory stands

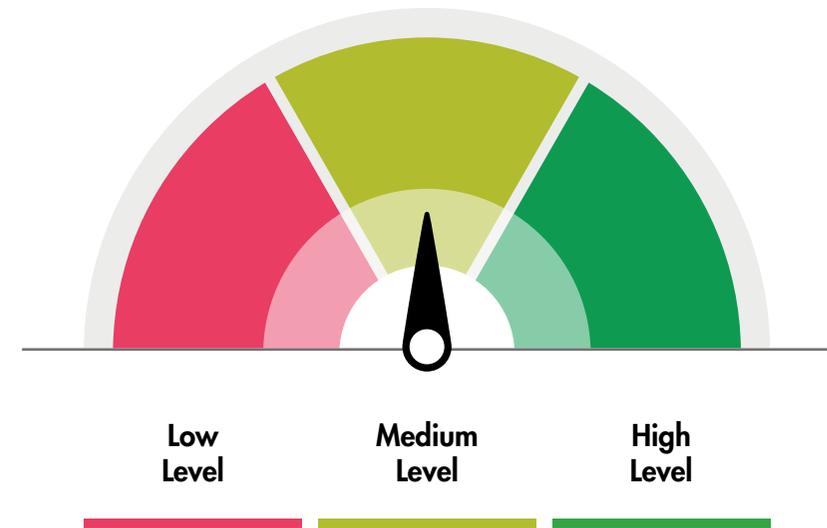
Ask yourself (and others in your organization):

- What processes are fully automated against others that are manual? Do not stop at robots and conveyors, think about visual systems doing inspections and quality checks and other methods to shorten cycle times.
- To what extent are your employees using manual updates and measurements?
- Try and estimate what would be the impact of automation on your factory: how dramatic will the change be? How much time will be saved? And what new activities can then be added to increase capacity and profitability?

Based on the small test above, you can check what category you fall under:

- 1. Low Level:** Most of the production processes are manual with almost no robots or advanced machines. Documentation of production progress is done manually. There is a need for human involvement in most process and manufacturing procedures.
- 2. Medium level:** While some processes are automated there are many others that are done manually where human involvement is needed. Manual typing of data, usage of Excels or local applications that are not shared throughout the enterprise slow down production and can potentially lead to errors and quality issues.
- 3. High level:** Key procedures are fully automated and streamlined, thus can benefit from zero human errors and a boost in production. Available automation solutions may include sensors that automatically indicate progress or alert in case of a problem - proactive maintenance alerts for equipment and machinery, and more.

What automation category do you fall under



Real example: The Airborne-Plataine collaboration

Manual picking and sorting of carbon fiber plies prove to be a real challenge for some aerospace manufacturers struggling to keep up with today's 'Rate up, Cost Down' dynamics. The automated Cutting and Kitting solution provided by Airborne and Plataine allows you to streamline all your cutting operations while saving material and reducing operations costs. While robotic cells perform complex sorting operations, these solutions enable employees to handle more complex tasks related to production while boosting the efficiency levels and reducing error and waste.

Category #3

How agile is your factory

Background

Agile manufacturing means flexible manufacturing, which is able to adapt to the changing circumstances and demands deriving from today's dynamic market.

The agile approach goes hand in hand with lean manufacturing, based on the understanding that the leaner your business is, the quicker it is on its feet, shortening time to market.

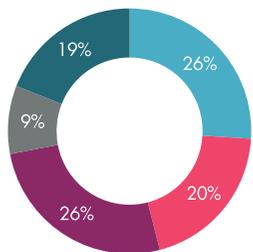
In addition to a few practical behaviors that enable lean and agile manufacturing, it also requires a specific state of mind that isn't rigid and remains open to new ideas and technologies, as well as the rapid iteration and fast response that comes with the package.

Building on its success among technology based companies, the principles of agility have expanded into other industries, such as manufacturing.

The numbers show

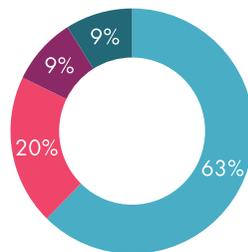
Generally speaking, agility is embraced by organizations worldwide, with the majority stating that they are advancing towards an agile work environment and consider it their top priority.

81% of respondent have started their Agile transformation within the last 3 years



■ Just Started ■ 1 Year ■ 2 Years ■ 3 Years ■ >3 Years

a majority of respondent (63%) state that it is a strategic priority to become an Agile organisation now



■ Yes, now ■ in 2 years ■ in 5 years ■ No

"A new study by KPMG among respondents in 17 countries shows that more than eight out of ten mid-sized to large organisations have now initiated or even completed an Agile transformation in the last three years."

When it comes to the manufacturing arena, we see that businesses understand the massive impact of agility on their factories in terms of quality, cost, time and revenue.

Manufacturers were asked: "Where do you see Industry 4.0 having the biggest impact"? Agility is ranked high.



■ Ranked #1 ■ Ranked #2 ■ Ranked #3

Category #3 - Test yourself

Estimate where your factory stands

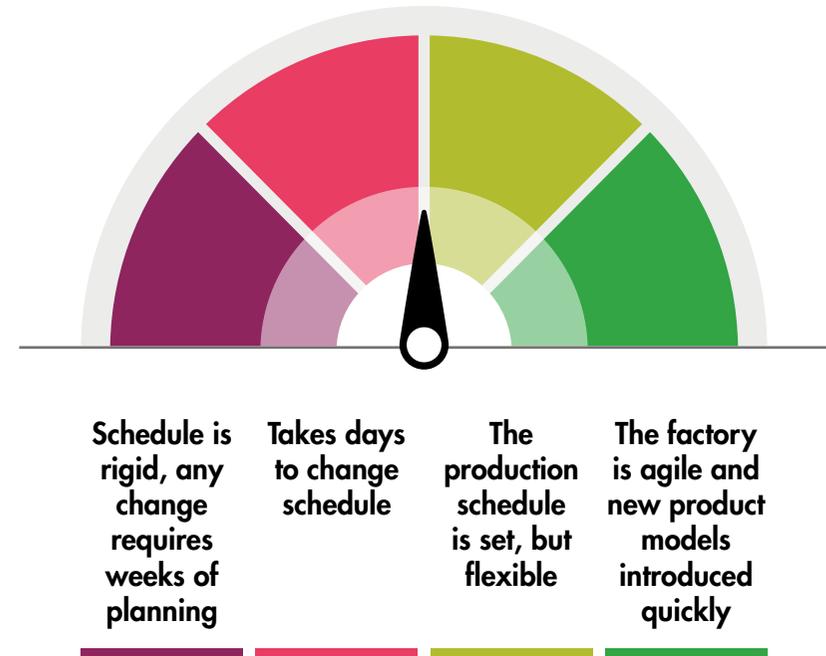
Ask yourself (and others in your organization):

- How easy (or difficult) it is to implement change and introduce new ideas in your organization?
- Is it easy to change batch size among other manufacturing factors?
- Is your production schedule set for the upcoming months, or is there room for questions and shifts?
- How much time does it take to introduce a new product model to the production line (from planning, testing to full production)?

Examine

1. How long does it take on average to implement changes in the factory during the recent years?
2. Whether such changes could happen faster or slower than before. Finally, look into the tools your business uses and see if there are testing and analyzing tools that support “what if” scenarios and trials.
3. If a rush order comes in, how much time will it take you to reschedule other jobs in the shift and assess the impact?

How agile is your factory



Real-life example: [Plataine for Renault F1 Team](#)

Formula 1 is the most competitive motorsport in the world, where each millisecond counts and is carefully calculated. The teams working for Renault have unique and intense deployment needs and rely heavily on innovation. Given the fact that there is always unexpected work that needs to be done fast and with great accuracy, solutions that promote agility, such as Plataine's IIoT solution, are of need. Such solutions allow the team to test new possible improvement, examine their influence on the overall performance and make necessary changes in time to make it to the race. Needless to say, these procedures are all paperless and based on advanced software and touchscreens.

Category #4

What is your equipment effectiveness level

Background

Overall Equipment Effectiveness (OEE) is the level of availability, quality and overall performance of equipment, machinery and tools in production.

It is a method of analysing the performance of a machine or piece of equipment compared to its theoretical maximum capacity.

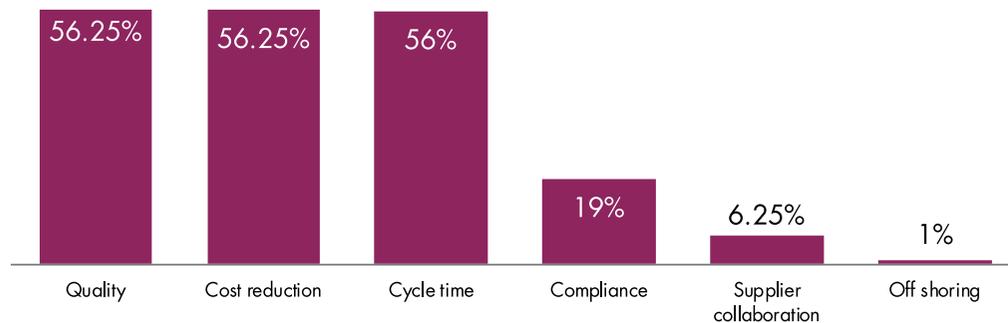
OEE calculations demonstrate to which extent a certain manufacturing business is able to effectively and efficiently utilize its tools, machines, workforce and all other resources in order to scale up its operations and still produce a quality product and reach satisfactory results.

By optimising OEE, you can increase capacity, reduce costs, improve quality, and increase efficiencies in your production lines. In other words, produce more products using your existing factory resources.

The numbers show

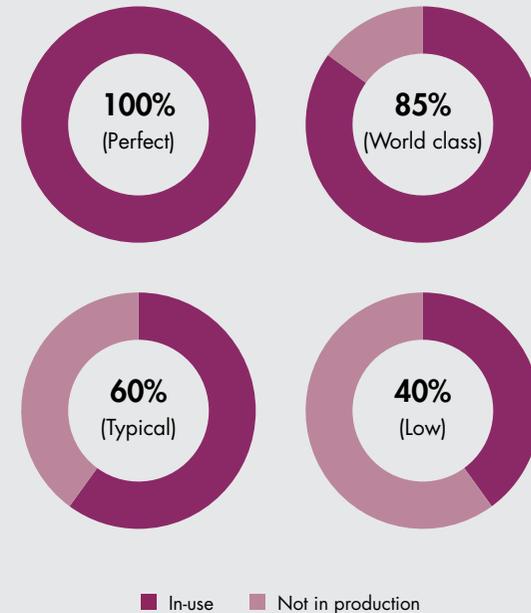
Since OEE combines many different factors, it's no wonder that many business goals are involved in the formation of this metric and are influenced by it at the same time. A study that combines different sources on the topic found that the top business goals to drive OEE measurements are quality, cost and time.

Survey of business goals driving OEE



Source: Medium.com

It's important to note that while manufacturers are focused on improving their OEE, their goal can never be a perfect score. In fact, the following stats should help manufacturing players understand their position based on realistic market criteria:



Source: Lean production

Category #4 - Test yourself

Estimate where your factory stands

Ask yourself (and others in your organization):

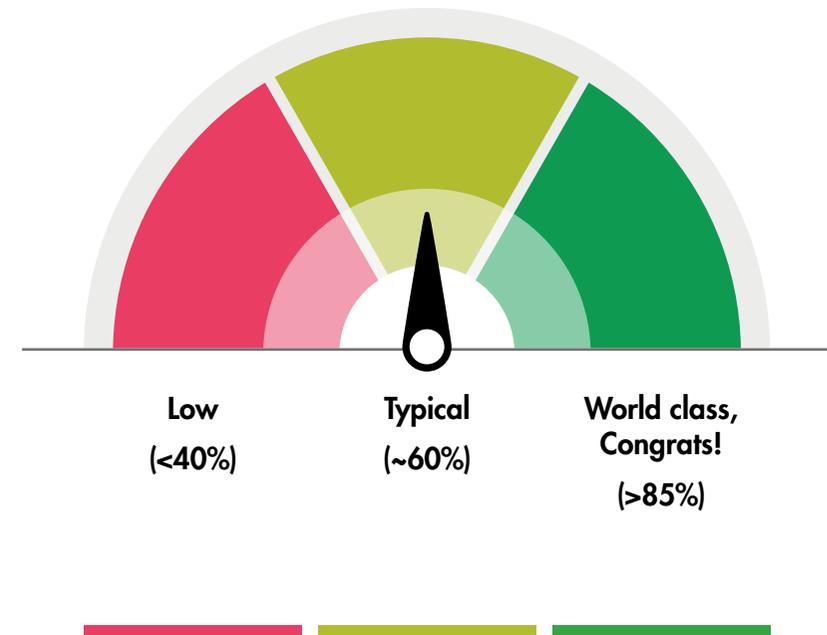
1. The first step is to see whether or not your manufacturing business even measures OEE as part of your production optimization efforts. If not, beginning to do so would be a good starting point
2. For organizations that do measure OEE, it's crucial to check and see how you measure compared to industry benchmarks.
3. Finally, evaluate the steps needed to improve your OEE and measure it more accurately. What should you focus on first? Which downtime seems to affect your production the most? What machine or tool setup can be avoided assuming smarter scheduling? Which smart solutions will help you perform these tasks more efficiently?

Without optimized or even measured OEE, you will continue to suffer setbacks, bottlenecks and will never know exactly why.

In addition to the ROI of OEE we've mentioned before, optimizing your OEE is a sure way of increasing your productivity.

With machinery and plant resources in top shape and proper scheduling and proactive maintenance, you will be able to significantly boost your workflow and overall business results.

What is your average equipment effectiveness level



Category #5

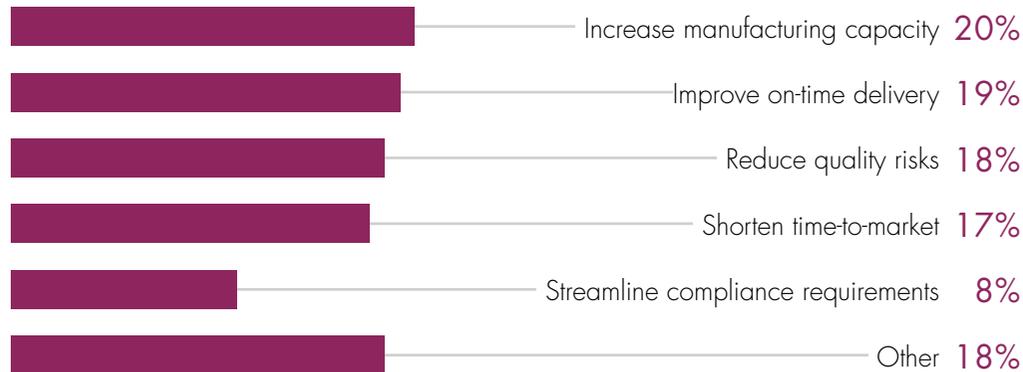
What is your time-to-market

Background

Time to market describes the length of the time period between a conceptualized idea and a finalized, marketed result. For manufacturers, it is often the time it takes to start mass production of a new model. This critical factor indicates how long it will be before an expensive process starts bearing fruits.

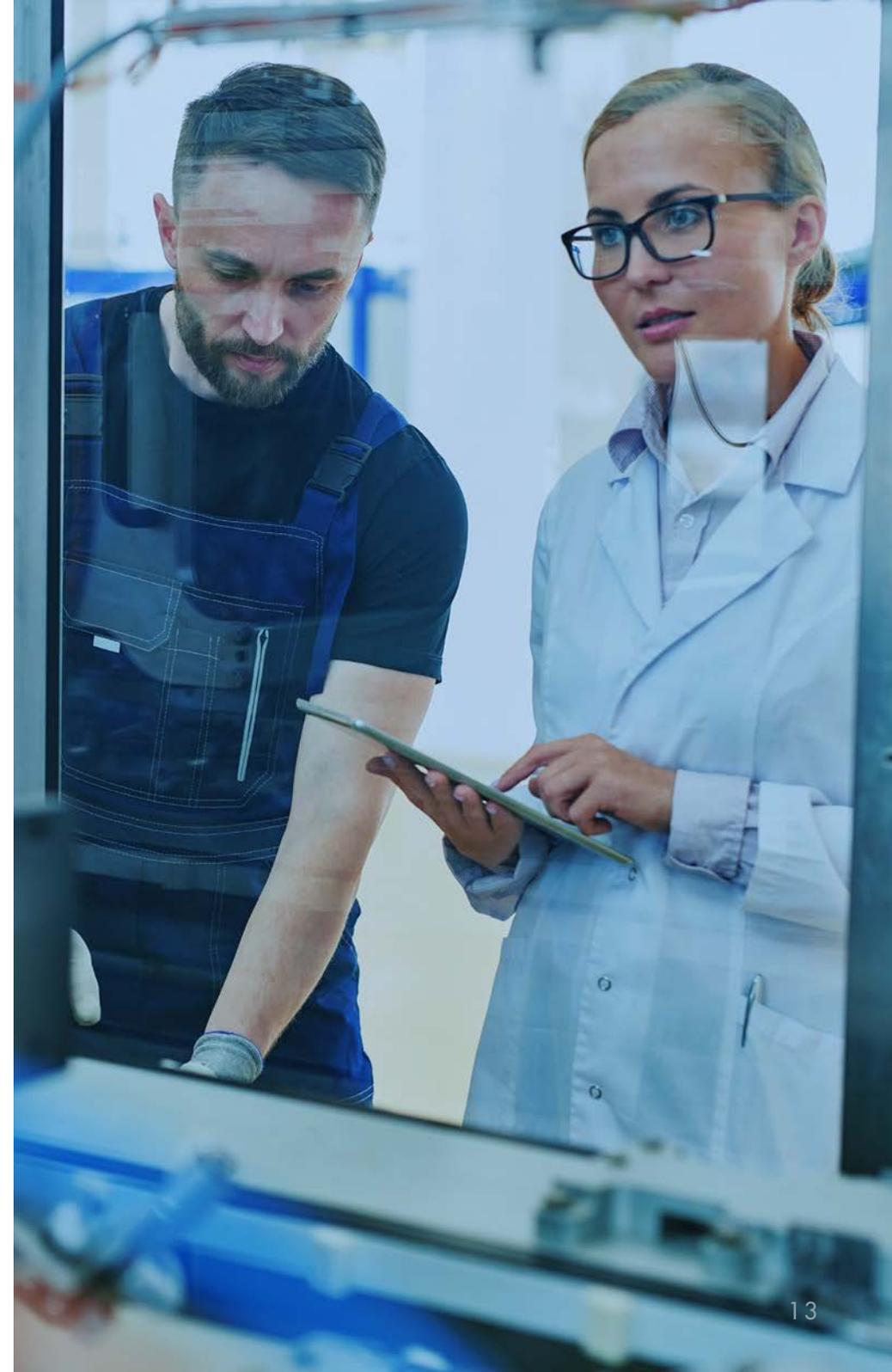
The numbers show

A survey that we conducted found that shortening the time to market is an important goal for manufacturers when implementing digitization procedures:



* The total responses add up to more than 100% as some respondents marked multiple options.

Source: SME and Plataine industry survey



Category #5 - Test yourself

Estimate where your factory stands

There are a few ways to improve time to market metrics, and examining how each one is implemented in your organization should help you assess your current status, as well as finding the key points to focus on.

Ask yourself

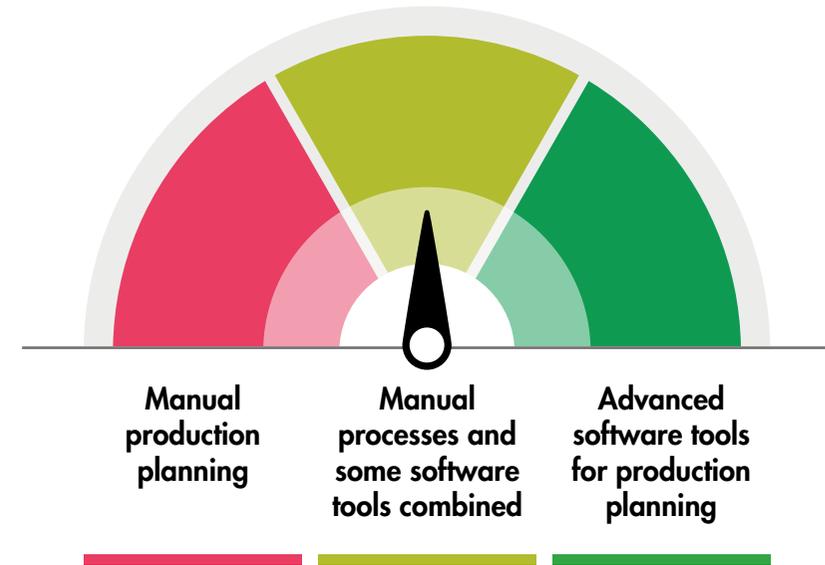
1. How much time does it take to plan and commission a new manufacturing line?
2. How much time does it take to introduce a new model into an existing production line?
3. How do you perform scheduling and rescheduling of different product models?

Accelerate the time to market by the following means:

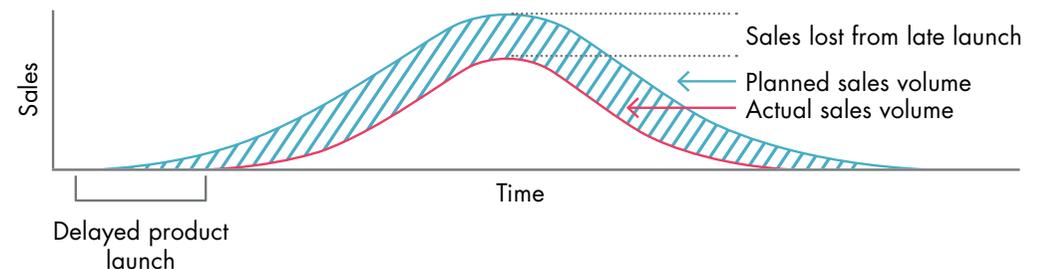
- Create a solid workflow, in which production planning and commissioning are minimized and responsibilities are clearly assigned.
- Automate as many time-consuming procedures as possible.
- Improve communication flows throughout the production line.
- Respond to issues in real time and implement the tools to alert and mitigate problems, as well as help you adapt to changes.

The implications of an unnecessarily slow time to market are simple as they are painful. It will impact negatively the revenues and not only delay them, but also lose market share to competitors who may not have presented as solid of a product, but were faster in reaching the target audience.

What is your time-to-market



Here's a clear visual demonstration of the losses that are derived by slow TTM:



Source: Arena solutions

Category #6

How smart is your material and inventory management

Background

Proper material inventory management ensures that enough material is available for the production flow at hand, on the other hand excessive material and work in process (WIP) leads to bottlenecks and wasting money and storage space. This involves proper predictions of material consumption, workload, and more.

Material inventory management challenges that manufacturers are struggling with today include:

- Moving inventory from the warehouse to the production floor
- Traceability and location tracking
- Misplacements
- Inventory quality issues
- Inventory planning
- Time/temperature sensitive material (in some advanced industries)

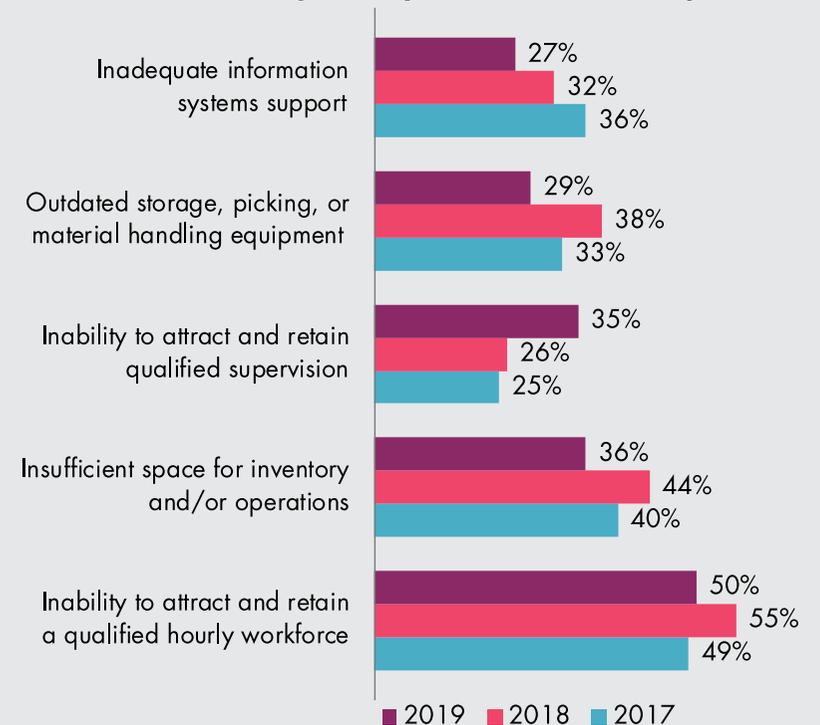
Inventory management optimization takes a major role in the smart factory concept, as Industry 4.0 brought a new era of technologies that transform the way manufacturers overcome related challenges.



The numbers show

When interviewing warehouse managers, many issues related to poorly managed materials arise.

Which of the following would you consider to be major issues?



As we can see, outdated materials and insufficient space are significant pain points.

Source: mmh.com

Category #6 - Test yourself

Estimate where your factory stands

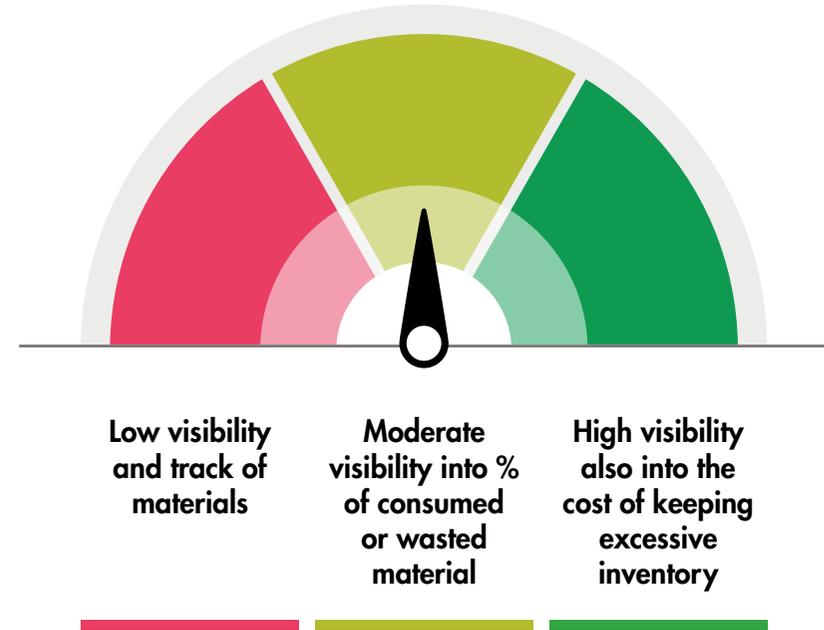
Ask yourself

- How do you keep track of your material?
- How smooth and efficient is the material acceptance process?
- Do you have complete and accurate visibility?
- Do you have any idea of how much is consumed and what percentage is wasted or about to expire?
- What is the cost of keeping your excessive inventory?
- How many systems track inventory levels like ERP, an Inventory management system?
- Are those systems aligned or is there a discrepancy?

The implications of lack of visibility and unmanaged materials are harsh, and will result in bottlenecks created due to misplacements or expired goods that were meant to be used in a project. The unnecessary costs of material waste that were not used and eventually expired (which in the manufacturing business accounts to a hefty sum), and wasted space that is dedicated to hosting materials which are not needed immediately or can no longer be used.

These all are significant cost areas that can truly impact profitability if optimized.

How smart is your material and inventory management



Category #7

What is your quality control level

Background

Last but not least, the challenge of quality was raised a number of times throughout this guide, because it is one of the most important aspects of smart manufacturing.

At the end of the day, producing a product on time we can be proud of and serving the needs of customers is a manufacturing business' top goal. There's no long lasting brand nor business flourishing without it.

In some manufacturing verticals such as aerospace or medical devices, there's no room even for the tiniest mistake or defect (with no need to explain why). While quality issues in these segments may rarely exceed the factory or impact the ecosystem (though it does happen), the need to overcome insufficient quality internally, during the production, can be extremely painful and even devastating to parameters such as the profitability.

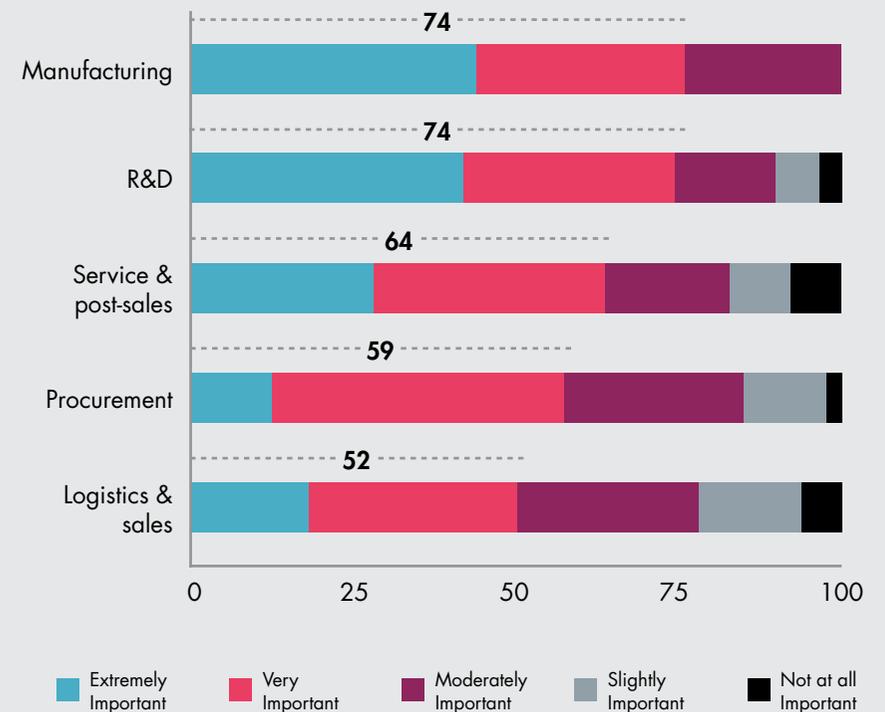
Smart quality control and assurance procedures enable manufacturers to detect and prevent defects, methodically review the quality of their hard work and ensure that only top-quality goods leave their plant.

This prevents the need for rework and added waste, helps maintain high retention and loyalty rates, while creating a strong business reputation.

The numbers show

Quality control is always important, but there are specific industries in which it is more crucial than ever, with manufacturing topping the list:

Importance of quality at each value chain stage (%)



Source: bcg.com

Category #7 - Test yourself

Estimate where your factory stands

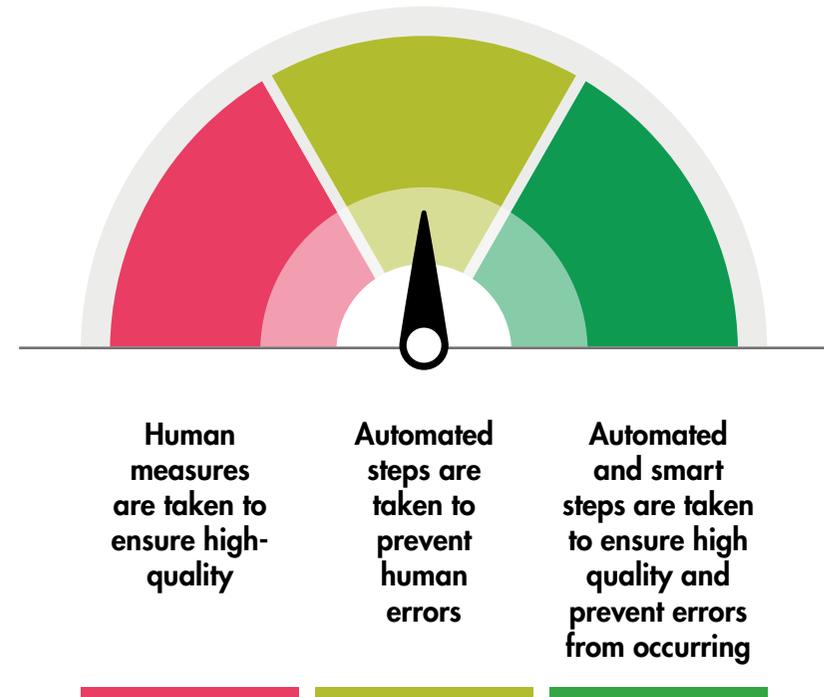
Ask yourself

- Which steps are taken in order to predict, track and ensure the high-quality of every product that leaves your production floor?
- How many of these steps are methodical, automated and smart enough to prevent human error from occurring in the first place? (Remember that issues can be drawn back to the quality of the equipment, raw materials or even the machinery settings).
- Which procedures are already attached to available automation solutions that for some reason, are not yet being used?

As mentioned above, the risk of low-quality products in complex manufacturing can be devastating. Quality defects can (and often do) crash the company's stock and deteriorate a business it took a lifetime of work to build. The risk of poor quality includes rework, wasted materials, PR and reputation management costs, and more.

By implementing Industry 4.0 smart solutions, manufacturers are able to predict quality defects ahead, escape production that leans on poorly maintained equipment, prevent human error, get real-time alerts, escape rework losses and enjoy a stable top quality production that is maintained at scale.

What is your quality control level



Summary & Conclusions

Here are a few of the key smart-factory areas we've discussed

1. A digitized work environment is the first and the key step towards smart manufacturing. Every other advancement will be built on top of the basic digital infrastructure you create.
2. Automated solutions help manufacturing businesses move faster and utilize their workforce in the best possible way.
3. An agile approach, which often accompanies lean manufacturing, helps manufacturers meet the dynamic needs of today's customers by implementing new technologies faster.
4. To make the most out of the resources at hand, it's important to optimize overall equipment effectiveness (OEE) level and improve every tool and machine that fail to meet their potential due to multiple reasons.
5. Smart manufacturing solutions can dramatically shorten Time to Market and allow to quickly introduce new products to existing production lines, keeping manufacturers one step ahead of the competition.
6. Advanced technologies that form proper material and inventory management procedures help manufacturers save costs and keep a lean organization.
7. Smart technology solutions can maintain a high level of quality and prevent the devastating loss that follows poor-quality results.

INDUSTRY 4.0 eBook SERIES

HOW SMART YOUR FACTORY REALLY IS

Professional Guide | Brought by Plataine

ABOUT PLATAINE: Plataine is the leading provider of Industrial IoT and AI-based optimization solutions for advanced manufacturing. Plataine's solutions provide intelligent, connected Digital Assistants for production floor management and staff, empowering manufacturers to make optimized decisions in real-time, every time. Plataine's patent-protected technologies are used by leading manufacturers worldwide, including Airbus, GE, Renault F1® Team, IAI, Triumph, General Atomics, AAT Composites, AVIC (Aviation Industry Corporation of China), Enercon, Hengshi and Stelia North America. Plataine partners with Google Cloud, Siemens PLM, McKinsey & Company, TE Wire & Cable, VIRTEK, the AMRC with Boeing, and CTC GmbH (an Airbus Company), to advance the 'Factory of the Future' worldwide. For this work, Plataine has received a Leadership Award from Frost & Sullivan and Innovation Awards from the JEC and CompositesUK organizations, as well as the Shanghai Society of Aeronautics (SSA). For more information, visit: www.plataine.com